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ABSTRACT

This paper describes a model training program designed to prepare high school guidance counselors to meet the challenge of expanding women's career options. In particular, it addresses the role which counselors may play in encouraging young women to acquire adequate mathematical preparation during their high school years. The first half of the paper reviews the relevant research on women and mathematics, while the latter half details the three major components of the model training program: Education, Assessment/Intervention Strategies, and Accountability. (Author)

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Early Intervention Training Program for Counselors: Women and Math

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INTRODUCTION

The Women's Movement of the 1970's has fostered a renewed interest in and concern for the educational experience of females in this society. One aspect of that experience which is receiving considerable attention is the development of career options for women. As we examine the female experience in general it is clear that many women's lives are less than satisfying because they are not economically self-sufficient and/or engaged in satisfying employment. Much effort therefore is being made to expand women's career options to include fields such as science and mathematics which have been traditionally dominated by males, for it is within these fields that the more lucrative and challenging careers often lie.

The purpose of this paper is to describe a model training program designed to prepare high school guidance counselors to meet the challenge of expanding women's career options. In particular, we have addressed the issue of the role which high school counselors may play in encouraging young women to acquire adequate mathematical preparation during their high school years. The latter half of the paper describes the model itself, while the section to follow details why a model training program is even necessary.

Mathematics and Sex

Many young women simply do not obtain the training in mathematics required for professional admission into science and mathematics disciplines. Several authors have pointed out that once mathematics becomes an optional sequence in the high school curriculum, young women tend to enroll in mathematics courses at a consistently lower rate than do young men (Ernest, 1976;

Fennema, 1976; Fennema and Sherman, 1977; Haven, 1972).

In the fall of 1972, Lucy Sells (1973;1976) found that 57% of a random sample of first year men at Berkeley had taken four full years of mathematics, compared with 8% of the first year women. Four years of a high school advanced mathematics sequence was required for admission to a college level math course which served as a prerequisite for all but those disciplines traditionally dominated by females. In other words, the vast majority of first year women, by virtue of their inadequate mathematical preparation, were forced to major in the lower paying fields -- the humanities, social sciences, librarianship, social welfare, and education.

Ernest (1976) replicated Sells' study at the University of California Santa Barbara. From a random sample of 50 first year men and 50 first year women, Ernest found that 36% of the males had four years of high school mathematics training, compared with 16% of the females. While the percentages differ somewhat from Sells' finding, it is clear that there is a significant difference between the sexes in terms of their high school mathematics preparation.

Rarely in the sex and mathematics literature have there been efforts made to examine ethnic differences and similarities. However, Hedges and Majer (1976) examined female and minority representation in college majors as a function of mathematics requirements at seven University of California campuses. When the number of mathematics courses required for undergraduate majors was correlated with the representation of Black females, Asian females, Chicano females and total female and male enrollment for these minority groups, significant negative correlations resulted for each total minority group with the exception of Asians. A significant positive correlation was found for all Asians, while no significant correlation was found for Asian females.

The pattern of female representation in mathematics and its allied disciplines continues throughout graduate school. In a study of 46 Association of American Universities (AAU) member schools, McCarthy and Wolfle (1975) examined the numbers and types of doctorates granted to women from 1969-1975. The AAU data indicate that out of 4,918 doctorates granted in mathematics (pure and applied) during thi six year span, only 363 (approximately 7%) were conferred on women. Furthermore, the data indicate that in engineering, an allied discipline, only one per cent of the 11,912 doctorates conferred during this period of time were earned by women.

If women's career options are to be expanded to include fields traditionally dominated by men, it is clear that they must be encouraged to obtain relevant training in mathematics while in high school. However, the point may be raised as to whether we are putting the "cart before the horse", for there are some who would argue that most women are "math anxious" and therefore cannot do well in mathematics. This concern is frequently raised and certainly warrants comment. But first a clarification of terminology is in order.

Math Anxiety

As is the case with any new term or phrase making its way into the research literature, definitions of it abound. "Math Anxiety" is no exception (Betz, 1977; Gallese, 1978; Richardson and Suin, 1972; Stent, 1977; Tobias, 1976). For the purposes of this paper, we will use the phrase "math anxiety" to refer to the experience of tension and/or fear associated with numerical manipulation or problem solving which often results in the avoidance of everyday mathematical problem solving, enrollment in mathematics courses, or the pursuit of careers that might require some mathematical expertise.

Nancy Betz (1977) studied 655 college students at Ohio State, and found that the more prior mathematics preparation a college student had, the less likely s/he was to report high levels of math anxiety. Furthermore, according to Betz's data, there is always some anxiety associated with mathematics irrespective of the student's sex or ethnicity. Implicit in Betz's findings is that a decline in debilitating levels of anxiety associated with mathematics may be achieved as a by-product of young women's increased participation in mathematics.

The question of whether women are capable of learning mathematics as well as men is a difficult one to answer empirically. It is frequently assumed that women do not do as well as men in mathematics. However, as Fennema and Sherman (1977) point out, much of the documentation supporting the sex differences favoring males fails to control for differential course taking. Secondly, as Fennema (1974;1976) points out, there are studies which suggest female superiority. The information most relevant to this discussion is that when women are enrolled in advanced mathematics courses and have adequate mathematics backgrounds they perform as well as men (Betz, 1977; Ernest, 1976).

Apparently, women can and should obtain the high school mathematics preparation necessary to allow them the option of pursuing occupations in fields in which women are traditionally underrepresented. The problem thus becomes, "How do we encourage young women to continue taking advanced mathematics once it becomes an optional sequence in the high school curriculum?" To answer this question, it would be helpful to examine some of the factors associated with a young woman's decision to elect mathematics.

Factors Associated with the Selection of Advanced Mathematics Courses

In 1972, Elizabeth Haven conducted a study involving girls from 63 senior high schools in an effort to determine why they chose to elect (or not elect) advanced mathematics courses. Those girls already enrolled in such courses indicated a liking for the subject matter and a perception of its usefulness as being the most important factors related to their continued enrollment. Those girls who did not elect additional mathematics courses (but who incidently had earned good grades in their three previous years of high school mathematics) indicated that they either did not particularly like mathematics, felt incapable of handling advanced mathematics, or that they did not need any additional mathematics.

Do women and girls avoid mathematics because they view it as a "masculine" endeavor and thus inappropriate for them? Aiken (1970) describes some studies in which girls do indicate that they view math as a masculine field. In a study by Sherman and Fennema (1977) however, the girls did not indicate that they felt math to be a male domain; the boys, on the other hand, felt strongly that math was a male domain. Betz (1977) and Ernest (1976) report that the women and girls in their studies do not indicate on respondent measures that math is a male domain. Although the data from the Betz, Ernest, Sherman and Fennema studies may appear to refute the studies mentioned by Aiken, the fact remains that females consistently take less math than their male counterparts. It may be, as Rossi (1965) suggests, that women do not see math or science as disciplines they cannot master, as much as they view them as fields in which future employment would conflict with anticipated familial responsibilities.

Some of the factors that seem consistently related to a student's choice to continue taking math are usefulness, enjoyment, confidence and encouragement from significant others such as teachers, counselors and parents (Ernest, 1976; Fennema and Sherman, 1977; Haven, 1972; Hilton and Berglund, 1974). Given these factors, as well as the felt need for young women to explore ways of integrating professional employment in math or science with familial interests, high school guidance counselors may prove to be a critical link in the process of encouraging more young women to take advanced mathematics courses.

The Role of the Guidance Counselor

The training guidance counselors receive and their professional standing within the schools make them a logical choice for spearheading interventions with individuals in educational settings. The role of the guidance counselor is pivotal in that it interfaces with that of student, teacher, administrator, and parent alike. This is an ideal position from which to impart and receive information, assist persons in need of counseling, and work to prevent problems before they arise. All too often, however, guidance counselors are limited in their functioning to petty record keeping and the "straightening out" of problem-labeled students.

Fortunately, counselors are beginning to rebel against the traditional confines of their role within schools. Within the profession there is a growing movement afoot to expand the conception of the counselor's professional responsibilities. This has come about, in part, due to the fact that counseling and guidance professionals are beginning to challenge the assumption that it is the student who has the problem, therefore the learning environment is not in need of change. Authorities supporting this view (Blocker, 1977; Carlson,

1972; Cook, 1972; Kuriloff, 1973) argue that if counselors are to be credible as well as effective they must assess the climate of the educational environment and determine if it is conducive to the personal and educational growth of all students. Furthermore, they assert that it is the responsibility of counselors to devise ways to alleviate debilitating aspects of the learning environment. With respect to women this is essential, as there are numerous subtle as well as glaring instances of sex-role bias to be found within the school environment. In addition to seeing a need for more of a focus on the learning environment, many counselors realize that individual and small group counseling are all too often remedial efforts, reaching a relatively small number of students. In order to reach more students, as well as provide early assistance, counselors are more inclined to engage other school personnel and parents in their efforts to assist students (Carlson, 1972; Dinkmeyer, 1968; McGehearty, 1968).

Counselor Attitudes Toward Women

When women turn to members of the counseling/guidance and other helping professions, the assistance they receive may often be clouded by sex-role bias. Mary Austin Doherty (1973) reviewed the sexual bias in Erikson's and Freud's theories of personality. By analyzing the assumptions of these theorists she concludes that: (1) both theories are based on the male experience, (2) implicit in both theories is the belief that women are what men are not (for example, men are described as rational while women are described as emotional), and (3) clinical interventions based on models like these are inappropriate for women.

In a study conducted by Inge Broverman and her colleagues (1970), 79

practicing psychologists and social workers (33 of whom were women) were asked to indicate along a scale of several bi-polar characteristics where a healthy male, female or adult (sex unspecified) should fall. The results showed a high degree of agreement among the professionals, regardless of the professional's sex. While healthy males and healthy adults were attributed similar characteristics, healthy females differed from both by being more submissive, easily influenced, excitable, dependent, non-competitive, unobjective, emotional, sensitive to being hurt, conceited about appearance, unadventuresome, unaggressive, and disliking of mathematics and science (emphasis added). According to these professionals then, for a woman to be "healthy" she must conform to the many sex-role sterotypical norms adhered to by our society. The implication is clear, as it relates to this paper: if a woman or girl does well in mathematics, or if she likes the subject matter, she may find herself caught in the quagmire of the paradoxical role she has been taught is hers.

Moving from psychological theory and the attitudes of helping professionals in general, what happens when female high school students seek help from their guidance counselors? Thomas and Stewart (1971) shed some light on this question in their study of secondary school counselors' reactions to audio tapes of female clients with traditional and deviate career goals. They found that while counselors, regardless of sex, were very accepting of the client's career choice, counselors rated conforming goals as more appropriate than deviate ones, and rated clients with deviate career goals as more in need of counseling than those with conforming goals. They concluded that a counselor's personal biases would most likely be communicated to the client, either overtly or covertly, during the course of counseling, and that "the female client who holds deviate

career goals over which she may already have ambivalent feelings may find herself in a more untenable position as a result of counseling rather than in a position of having obtained actual help in working through her concern" (Thomas and Stewart, 1971, p. 357).

Schlossberg and Pietrofesa (1973) tested the hypothesis that counselors are biased against women entering a "masculine" occupation. By arranging interviews between counselor trainees and a coached female client who expressed an interest in becoming an engineer, they explored the encouraging versus the discouraging responses or statements made by the counselors. All the counseling sessions were taped. The tapes were reviewed with responses tabulated and content analyzed for positive (encouraging) and negative (discouraging) bias. The study revealed that both female and male counselor trainees were biased against women entering professions that are traditionally thought of as "masculine".

With respect to the specific question of mathematics course selection, guidance counselors are sought for advice. In a study of high school women who had successfully completed at least one advanced mathematics course, Haven (1972) found that over 80% of the women in the three groups she examined (women expecting to major in mathematics, science or engineering; women expecting to major in other fields such as the social sciences or the humanities; and women who had no definite career plans) discussed advanced mathematics courses with their high school guidance counselor. Approximately 49% of these young women were encouraged to take advanced mathematics courses, with an equal number being discouraged by their high school counselors. Those women who were not certain what career options they might be exercising were discouraged more than those young women who were planning to attend a college or university upon graduation.

SUMMARY

If women are to achieve parity in this society they must have access to all avenues leading to gainful employment. Presently women are, by virtue of their educational preparation (or the lack of there), limited to a small number of professions which have been deemed "women's work". In order to overcome the educational barriers, hence the employment barriers, to mathematics and science careers, women must be encouraged to continue their mathematics training.

In this paper, it has been argued that guidance counselors could be critical persons for beginning to interrupt the vicious cycle of career exclusion that begins with inadequate preparation in high school mathematics. They are, first of all, trained to assist students in their personal and academic maturation. They also work with other school personnel and parents. Thus, they are capable of having an impact on all the persons who may influence a student's decision to elect advanced mathematics courses.

A young woman's decision to elect mathematics is associated with a complex set of factors, both personal and environmental. Therefore if counselors are to be helpful, they must be educated as to the nature of the problem in general and to ways in which their own biases and those of other significant persons may act to perpetuate the insidious nature of the cycle. In addition they must be taught to assess objectively their own school environment and its impact on women students. Finally, they must learn to devise efficient and relevant intervention strategies for dealing with the problem. The remainder of our paper outlines the type of counselor training we feel to be appropriate.

MODEL FOR EARLY INTERVENTION TRAINING PROGRAM FOR COUNSELORS

Purpose of the Model

This section of our paper describes a model training program designed to help high school guidance counselors work more effectively with female students who have experienced some form of math anxiety. In addition, the training will provide counselors with many of the skills necessary to begin responding proactively, rather than reactively, to the precipitating causes of math anxiety which may be isolated in the school environment. The ultimate goal of the training program is to increase the rate at which female high school students enroll in optional advanced mathematics courses. Successful course completion is in turn felt to increase students' post-high school vocational, undergraduate major, and career options.

Rationale

The model proposed herein is divided into three major components to be expanded upon in the remainder of the paper: Education, Assessment/Intervention Strategies, and Accountability. Its creation was guided by the philosophy that high school guidance counselors, to become effective change agents in their work environments, must be 1) educated regarding the general nature of the problem, 2) capable of determining the extent of the problem in their own school environments and designing intervention strategies which are appropriate for their settings, and 3) able to assess the degree to which the interventions implemented are meeting the goals for which they were designed.

Format and Target Audience

This model was designed with an in-service training format in mind. Thus

training would take place during and after school hours under the supervision of university specialists with expertise in counseling psychology and mathematics education. However, additional formats present reasonable alternatives, such as university instruction and training during summer school sessions with follow-up studies to be conducted during the first semester (or quarter) of the regular academic year.

The target audience for whom this training model was designed is high school guidance counselors whose counselees include female students. The components of the model were formulated based on needs indicated by the research literature on women and mathematics. Although much of the research to date has been confined to white, middle class females, we feel that the tailored nature of this training model would make it appropriate for use with counselors of non-white female students as well.

Whereas the model presented herein is an INTERVENTION model, we can easily see a modification of it working quite effectively with counselors of male and female students at the elementary level. In this way the move is toward a more PREVENTATIVE model which stands to be of benefit to all students who may be in need of assistance. We would suggest as well that although the model specifically relates to the problem of math anxiety in high school females, it should be viewed in the larger context of providing a paradigm for proactive counselor training, regardless of the nature of the problem being addressed.

EDUCATION

It has been our observation that many high school guidance counselors are so involved in the day-to-day management of the guidance office (meaning handling tardy slips, completing regulatory paper work, making parental contacts,

and the like) that they may be unaware of the important role which they can play in advising students on matters of course selection and career planning. Our recent discussions with counselors in fact suggest that advising sessions may often be viewed as another time-consuming, compulsory activity which must be completed so that time can be made for involvement in "real" counseling (i.e., crisis intervention or prevention with troubled students, either in groups or individually).

This model therefore proposes as an initial step that counselors be educated regarding the importance of increasing the rate at which female high school students pursue appropriate advanced mathematics courses. The Education component of the model in fact involves four major objectives, with suggested strategies for achieving these objectives detailed below:

I. Provide instruction to counselors regarding the "critical filter" role which high school mathematics preparation plays in determining future educational and career options for women.

   A. Provide readings which document the extent of the problem nationally and internationally.

   B. Discuss, via case studies for example, the implications for high school females who choose to enroll or not enroll in advanced mathematics courses once mathematics becomes an optional component of the high school curriculum.

   C. Give examples of the types of vocational, career, or educational pursuits which require some advanced mathematical preparation as a prerequisite for serious commitment.

II. Have counselors examine their own attitudes toward the learning of mathematics.

   A. Provide time for counselors to complete an attitude survey designed to assess their attitudes toward the subject matter (for example, an adaptation of the Fennema-Sherman Scales might be designed for use with a more general non-student audience).

   B. Encourage counselors to write mathematical autobiographies which

would help them assess the extent to which certain key factors (for example, parental attitudes or sex-role stereotyping) shaped their attitudes toward the learning of mathematics.

C. Structure group exercises which would facilitate counselors' understanding of the relationship, if any, between their preparation in and attitudes toward mathematics and their present occupation and long-range career goals.

D. Allow group discussion of the individual counselor's data in a non-threatening and supportive environment.

III. Have counselors examine the extent to which their attitudes toward mathematics affect their counseling and advising interactions with female students.

A. Provide an opportunity for counselors to interact with a coached counselee who presents herself as being math anxious. Analyze the interaction for any signs of counselor bias (whether positive or negative), using these data as the basis for group discussions.

B. Encourage counselors to recall any specifically relevant counseling sessions they have experienced, providing details such as sex of student, presenting problem, role played by counselor, outcome and follow-up of student.

C. Show video-tapes of staged counseling sessions where counselor biases are transmitted to students presenting problems of math anxiety. Allow counselors to critique the tapes and suggest alternative forms of more appropriate counselor behavior.

D. Encourage role-playing of specifically relevant counseling sessions such that counselor responses viewed as bias-free may be practiced and discussed. Stress the contrast in counselor behavior which may be evident from the point when exercise A was conducted.

ASSESSMENT/INTERVENTION STRATEGIES

Once counselors have been sensitized to the urgency of the problem and the role which they may play in contributing to and/or alleviating the problem, it is important that they learn to determine the extent of the problem in their own school settings and to assess the degree to which environmental factors in their school may be affecting the participation of female students in advanced

mathematics courses. With a better understanding of major contributing factors, appropriate intervention strategies may be designed as deemed necessary for the counselor's particular school setting.

Our model training program provides a systematic approach to assessment and the development of appropriate intervention strategies. This approach not only helps counselors better acquaint themselves with their own school environments and students' needs, but it has the added benefit of providing counselors (some of whom may be math anxious themselves) with highly relevant mathematical problems to solve within the context of their training. The objectives of the Assessment/Intervention Strategies component and suggested procedures for fulfilling these objectives are detailed below:

I. Provide counselors with the means and instruments necessary to begin assessing the needs of their female students with respect to mathematics course-taking and related career pursuits.

   A. Give background instruction in basic test and measurement concepts (including test construction), as many counselors' training programs might not have prepared them to construct reliable, valid and unbiased assessment instruments.

   B. Provide practice exercises wherein observational skills are learned which would be helpful when observing teacher-student interactions in mathematics classrooms.

   C. Role-play interviewing sessions so that techniques for communicating with teachers, parents, and students can be refined.

II. Train counselors to examine their own school environments with an eye toward biases which favor or oppose advanced mathematical preparation for female students.

   A. Discuss strategies which may help counselors gain an enthusiastic and cooperative response toward their efforts from parents and key school personnel who may play critical, supportive roles in any intervention undertaken.

   B. Help counselors construct a behavioral checklist useful in assessing the presence or absence of key factors in their school environments

which may be related to the enrollment of females in advanced mathematics courses (for example, mathematics tutorial sessions or career days highlighting female mathematicians).

C. Help counselors determine other types of data they may collect in order to better understand their school environments (for example, ratio of male/female mathematics and science teachers; ratio of male/female students in required and optional mathematics and science courses; grade distributions in mathematics and science classes by sex of student).

D. Encourage counselors to interview mathematics department heads and teachers to gain a better understanding of their attitudes toward women and mathematics.

E. Have counselors examine mathematics text books and other instructional materials to determine the extent to which these materials are free from sex-role stereotyping.

III. Provide counselors with the skills necessary to plan and implement realistic intervention strategies based on the specific needs established through their assessment.

A. Have counselors problem-solve around case studies which depict the needs of math anxious students, providing data about the students as well as their school environments.

B. Encourage counselors to begin to establish general profiles of math anxious students so that early identification and intervention can be facilitated.

C. Stress the importance of providing alternative intervention strategies which are carefully matched with the assessed need (for example, low achieving students may benefit from peer tutoring; truly anxious students may require individual counseling sessions; some students may profit from a workshop on how to prepare for and relax during examinations; mathematics teachers may benefit from specially designed workshops).

D. Have counselors begin to design more long-term intervention strategies to modify the more complex psychological and environmental factors that may impede females' greater enrollment in high school mathematics courses.

ACCOUNTABILITY

The final component of our training model is in fact the most important;

that of accountability. Counselors need to know which intervention strategies work, why they work, and what goals were accomplished if they are to be in a position to expand upon or redesign strategies implemented in their school settings. This would of course lead to retention of those intervention strategies which most efficiently yet humanely achieved the counselor's desired goal or outcome.

Furthermore, having a systematic record of data regarding the effectiveness of counselor-initiated interventions will enhance and more firmly establish the counselor's role within the structure of the school. Without the skills necessary to build monitoring procedures to assess their own effectiveness, counselors will continue to be left vulnerable to budget and personnel cuts due primarily, we suspect, to the ambiguity often associated with the delineation of their professional responsibilities and the lack of concrete data to support the importance of their contribution.

With the accountability skills addressed in this component of our training model, counselors could begin to take a more advocacy-oriented position in general, as they would be in the position to provide data to teachers, administrators, and parents regarding student needs and the current status of counselor-initiated strategies designed to meet those needs. This will be particularly beneficial to counselors when working with math anxious students (or the environments which contribute to the problem of math anxiety), as many intervention strategies will still be in the early test stages and their effectiveness will therefore continue to need careful monitoring. The objectives of the Accountability component, along with suggested instructional training strategies, are detailed below:

I. Provide counselors with the skills necessary to behaviorally define the goal (i.e., desired outcome) of the intervention strategies they pose.

A. Discuss specific case studies of math anxious students and contributing environmental factors, such that counselors can practice determining appropriate goals to be anticipated given the nature of the problem and the desired intervention strategy.

B. Stress the importance of reducing complex long-range goals to realistically measurable interim objectives.

II. Train counselors to manage simple data collection techniques which will enable them to assess the extent to which the anticipated goals of their intervention have been met.

A. Provide practice exercises wherein counselors are asked to collect simple types of data and report their findings to the other counselor trainees.

B. Familiarize counselors with a variety of types of data that might be used to assess the extent to which female students are enrolled, learning, and comfortable in optional mathematics courses (for example, results of mathematics attitude surveys; student rates of participation in optional mathematics study groups; yearly participation rate of female students in mathematics and science fairs or contests; grades received by students who had previously attended a workshop designed to improve their test-taking skills).

C. Emphasize the importance of making appropriate matches between the data being collected and the goal or outcome desired as a result of intervention (i.e., will you know from the data collected whether you have met your goal?).

III. Encourage counselors to incorporate the interpretation of their assessment data into the planning of subsequent intervention strategies.

A. Discuss any known outcomes of specific intervention strategies which have been tested (for example, evaluation reports of currently operating math anxiety clinics).

B. Show how these results may be used to generate ideas for efficient and effective strategies for future intervention.

C. Encourage counselors to systematically publicize the results of their efforts so that others may benefit as well from their experience. This may be through Parent-Teacher organizations, school newsletters, professional journals, or counselor-initiated workshops.

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